

**REMARKS**

Favorable reconsideration is respectfully requested in view of the foregoing amendments and the following remarks.

**I. Claim Status & Amendments**

Claims 25-44 and 50 were pending in this application when last examined and stand rejected.

Claims 25, 36, 37, and 50 have been amended. Support for the amendments to claims 25, 36, and 50 can be found in the disclosure, for example, at page 6, lines 29-30, page 7, lines 1-3 and claims 36-37. Further support for the amendment to claim 25 can be found at page 12, lines 19-21. Support for the amendment to claim 37 can be found in the disclosure, for example, at page 5, lines 20-22. No new matter has been added.

**II. Prior Art Rejection**

Claims 25-44 and 50 were newly rejected under 35 U.S.C. § 102(e) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over Hyeon (U.S. 2004/0247503 A1) for the reasons on pages 4-7 of the Office Action.

Applicants respectfully traverse the rejection as applied to the amended claims.

To start, Hyeon et al. disclose a method for the preparation of metal oxide nanoparticles comprising the

following steps:

- synthesizing a metal surfactant complex by reacting a metal precursor and a surfactant in a solvent,
- synthesizing monodisperse metal nanoparticles by thermally decomposing the metal-surfactant complex,
- completing the formation of the metal nanoparticles by adding a poor solvent followed by a centrifugation process,
- dispersing, then oxidizing, the metal nanoparticles using an oxidant to produce metal oxide nanoparticles. See, for instance, page 6, line 13 to page 7, line 2, and claim 1.

However, this process of Hyeon et al. contrasts the process of amended independent claims 25 and 50 of the instant application. Specifically, the process of oxidation in Hyeon et al. is not a process for the direct preparation of metal oxide nanoparticles and it requires numerous steps to obtain metal oxide nanoparticles.

Nevertheless, Hyeon et al. appear to also describe a method for the direct synthesis of metal oxide nanoparticles comprising the steps of:

- synthesizing monodisperse metal oxide nanoparticles by adding a metal precursor, an oxidant, and a surfactant to a solvent in one container to prepare a mixed solution followed by a heating process (i.e.

thermodecomposition), and

- completing the formation of the metal oxide nanoparticles by adding a poor solvent followed by a centrifugation process. See, for instance, page 7, lines 3-7.

However, the only example in Hyeon et al. of direct synthesis of metal oxide nanoparticles uses trimethylamine N-oxide as oxidant and a thermal decomposition at 300°C. See, for instance, page 21, line 11 to page 22, line 8, Embodiment 6. Moreover, this method requires three times or more repeated washing process in order to remove by-products.

By contrast, the claimed process involves the preparation of a composition of nanoparticles of crystalline metal oxide in which a liquid solution of organometallic precursor is formed, and the liquid solution is brought into contact with an oxidizing agent selected from the group consisting of water, ambient air, and pure dioxygen gas at ambient temperature to thereby directly bring about the production of nanoparticles of crystalline metal oxide(s). See amended claim 25. Thus, the claimed process is very different in that the metal oxide nanoparticles are obtained under mild conditions of ambient temperature of amended claim 25. It is believed that Hyeon et al. fails to disclose or suggest the claimed process of producing metal oxide nanoparticles under mild conditions of ambient temperature using an oxidizing agent selected from the group consisting of water, ambient

air, and pure dioxygen gas of amended claim 25.

For this reason, it is believed that Hyeon et al. cannot anticipate or render obvious independent claim 25, because it fails to disclose or suggest this feature of the claim. Thus, independent claim 25, and all claims dependent thereon, are believed to be novel and patentable over Hyeon et al.

Indeed, dependent claim 37 as amended even specifies that claimed process does not require thermal treatment steps as required in the process in Hyeon et al. In other words, claim 37 excludes the extra thermal heat treatment step in Hyeon et al.

Furthermore, it should be noted that the claimed process is advantageous in that it can be carried out easily, whereby it is more economical and environmentally safe. In this regard, since the claimed process is carried under the above-noted mild conditions at ambient temperatures, it produces fewer by-products. In other words, it produces less polluting waste. See, for instance, the description on page 5, lines 16-22 of the specification. By doing so, the claimed process does not require additional processing steps, such as a washing step.

Based on the above, it is believed that Hyeon et al. disclose a different method for the preparation of metal oxide nanoparticles than that of amended independent claim 25.

As to independent claim 50, it should be noted that this claim now recites "consisting essentially of", and thereby excludes the extra steps recited in Hyeon et al.

For these reasons, it is believed that Hyeon et al. cannot anticipate claims 25 and 50.

As to obviousness, it was not at all predictable that performing the process under the mild conditions as recited in the amended claims could lead directly to crystalline metal oxide nanoparticles. In fact, prior to the Applicants' invention, it was considered necessary, in order to obtain nanoparticles of crystalline metal oxide nanoparticles, to go through a composition of metal nanoparticles as an intermediate, because metallic oxides are not prone to crystalline coalescence and the growth phenomenon described on page 7, lines 8-18 of the specification. That is why the growth of metal oxide crystals was considered to require the application of high temperatures as discussed on page 7, line 20-23 of the specification. This is supported by the disclosure in Hyeon et al. For instance, on page 13, lines 2-5, Hyeon et al. disclose that the resulting mixture is preferably heated at a level of about 300°C.

Accordingly, it was completely unforeseeable to obtain crystalline metal oxide nanoparticles by the claimed process which is carried out at ambient temperature without a thermal heat treatment as described on page 7, lines 25-31 of

the specification.

This is consistent with the state of the art as represented by Murray et al. (US 6,262,129), cited in the previous Official Action. Murrey et al. disclose that the growth of particles cannot occur if the temperature is lower than 100°C. See column 7, lines 31-36 of Murray et al. Th

Also, as noted above, Hyeon et al. only disclose one example of "direct" synthesis as discussed in Embodiment 6. Yet, this "direct" synthesis in Hyeon et al. required a high temperature treatment at 300°C to obtain iron oxide nanoparticles in that example.

Accordingly, nothing in Hyeon et al. would have led the skilled artisan to achieve the claimed process for preparing nanoparticles of crystalline metal oxide at ambient temperature and air.

For these reasons, it is believed that Hyeon et al. fail to disclose or suggest each and every feature of the amended claims. Thus, it is believed that the independent claims, and all claims dependent thereon, are novel and non-obvious over Hyeon et al.

Therefore, withdrawal of the above anticipation/obviousness rejection is requested.

Lastly, Applicants are in the process of preparing a Rule 131 Affidavit to demonstrate reduction to practice of the claimed invention prior to the effective 102(e) date in Hyeon

et al. Applicants will consider submitting such in a follow-on Supplemental Response in due course and preferably within the next two to three weeks. If at all possible, please delay acting on the case until such is filed.

### **III. Conclusion**

Having addressed all the outstanding issues, the amendment is believed to be fully responsive. In view of the above, it is respectfully submitted that the application is in condition for allowance and notice to that effect is hereby requested. If the Examiner has any comments or proposals for expediting prosecution, please contact the undersigned attorney at the telephone number below.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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